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COMPUTERIZATION OF AGRICULTURE, FOOD INDUSTRY OUTLINED

Bratislava EKONOMIKA POLNOHOSPODARSTVA in Slovak No 3, 1982 pp 134-135

[Article by Eng Jan Liska, Enterprise for Rationalized Management of Agriculture and Food Industry, Bratislava: "Possibilities of the Application of Minicomputers and Microprocessors in The Agriculture and Food Industry"]

[Text] Automated information and computation processing in agricultural and food industry organizations is performed mostly with high-performance third-generation computers, located in computer centers of the Enterprise for Rationalized Management of The Agriculture and Food Industry. The computer centers are equipped with EC 1040 and EC 1033 computers operating in the batch mode and processing with priority information concerning the entire county for the purposes of agricultural enterprises. Also, individual economic production units [VHJ] began to process information and computations for management purposes using computer technology of their own. These are, e.g., Agrokomplez VHJ, Agricultural Supply and Purchase, Slovosivo, Machine and Tractor Stations and Agricultural Machinery Repair Shops, Milling and Bakery Industry, Viniculture Enterprises, Liko, Czechoslovak Tobacco Industry and other.

At present there is a need to switch to distributed information processing using smaller computer systems. Therefore, the electronic industry is preparing the manufacture and supply of minicomputer and microprocessor systems for the economic production management and for the control of technological processes in individual areas.

Application of Small Electronic Computers in the Basic Production Agricultural Enterprises with the Automated Control System (ASR)

For one-third of the basic agricultural production enterprises in Slovakia the ASR subsystems are processed in high-performance EC 1040 computers according to a uniform project facilitating processing of enterprise information for all enterprises in the county as well as the aggregation of information for the needs of the county agricultural administrations.

In the Seventh Five-Year Plan, information will continue being processed in EC 1040 and EC 1033 computers for entire counties, while minicomputers and microprocessors of the Small Electronic Computer System (SMEP) will be applied to:
--preparation and preprocessing and transfer of data (PPPD) to master computers;

--data processing for enterprise organizational wholes;
--creating a network of cooperating SMEP minicomputers;
--control of manufacture and technological processes by minicomputers and microprocessors.

It is expected that the data will be prepared on perforated tape, magnetic cassette, standard magnetic tape and floppy disk. Minicomputers and microprocessors will be employed in the process of media formation for a medium-size computer, to which, at the beginning, perforated and magnetic tapes or disks will be transported to be processed. In the future, depending on the capacities of the telecommunication network and modulation and demodulation equipment, data will be sent to the computer center through telecommunication lines and the processed results will be sent from the computer to a printer controlled by a minicomputer.

For counties not connected to the ASR processing subsystem high-performance computers, and in 1981 two-thirds of the agricultural counties in Slovakia were not connected to these computers, SMEP computers are considered to be used by small organizational groups of enterprises or for large enterprises with several facilities. This will also solve the substitution of the present DP 100 punch-card computers. In this case, there are three types of input:
--through CRT terminals,with alphametric keyboards; for short and, later, also long distances;
--paper or magnetic media;
--photosensing marks using the OCR [character on/off-line correction] equipment.

Information can be processed in data files or by building data bases for specific purposes; gradually there will be transition toward an integrated information system for the purposes of operative and conceptual management in enterprises. Minicomputers will serve their own users and, at the same time, they will provide media for a master high-performance computer, such as SM 5211, at the level of county agricultural administration or other intermediate management link. These minicomputers can be connected horizontally into the computer center network and vertically they can be connected to a more powerful master computer. The program design of the network data communication connection is called SYRPOS--computer network control system.

Supplemented by measuring regulation equipment, the minicomputers and microprocessors developed as part of AMEP I and SMEP II can be used to control suitable manufacture and technological processes, for instance, in the manufacture of granulated fodder, in drying and air-conditioning processes, in large stables, transport line control, in warehouses etc. SM 5310 minicomputers and SM 50/40 and SM 50/50 microprocessors can be combined into distributed control systems in extensive production wholes.

Application of Small Electronic Computers in ASR in County and Kraj Agricultural Administrations.

In the second half of the Seventh Five-Year Plan, computer systems built up of minicomputers and microcomputers of the 3.5 generation will permit forming and using medium-performance systems for economic mathematical calculations and processing of information aggregated from the enterprise systems based on the automated data bank principle.

Under local conditions, these systems will allow operation with several terminals in the question-answer mode using classic inputs and outputs to printers, microfiche technique, or graphic output equipment.

These systems will also permit combination with radiocommunication and telex systems as well as remote processing of data obtained as some specific information on an area studied within a county or VHJ, for instance, in dealing with transportation problems, in operational control, in cooperation actions aiming at the coordination of the utilization of labor force, material, power and fuels, in the control of the use and transportation of agricultural machinery during seasonal work or in dealing with the situation in animal and plant production, in particular types of services and areas of the food industry and in dealing with damage caused by climate calamities.

Application of AMEP Computers in the ASR of the Services VHJ

In Slovosivo, a scientific manufacture association for seeds and cultivation, minicomputers will be used in accordance with the function of the scientific manufacture association organizations:
--in evaluating research assignments on experimental cultivation of grain, sugar beet, corn and potatoes;
--in processing the purchase-sale activities of seed enterprises within a kraj, primarily in purification, purchase and sale of seed and seedlings, including billing;
--in seed enterprises in processing automated systems for agricultural production.

State breeding enterprises can employ microcomputers in preprocessing data, in some scientific technical and mathematical calculations and later even in the area of economic information processing.

A SM 4-20 minicomputer will be installed at the Permanent National Agricultural Exhibition Farm, Agrokomplex, in Nitra in 1984. It will serve to test automated systems of plant production operational management and enterprise management as related to the management of the entire FHJ and other problems. The minicomputers will serve as a basis for building kraj pack/unpack facilities, where background documentation will be prepared to be processed for the entire VHJ.

Mini-and microcomputer systems should serve as data concentrators for operative information processing and for building ASR's in individual enterprises of the Agricultural Supply and Purchase VHJ.

Application of SMEP Computers in Food Industry ASR's

In the Slovak food industry, several VHJ's began using small computers as early as in the Sixth Five-Year Plan. These were:

--EC 1010 small computer in the poultry industry;
--MERA 305, CELLATRON and ROBOTRON 1840 office minicomputers in distilling and preserving industries;
--MERA 305 in the tobacco industry;
--RPR 16 control computer in the sugar industry.

During the time when solutions for these applications were sought, teams of designers first formed in the area of processing information on production and economic activities and partly also in the area of technological process control. Thus the first technical basis for computer operations was created.

Further development in the application of small electronic computer systems in the food industry will concentrate on the control of production economic activities and manufacturing and technological processes.

In 1981, the meat industry bought a powerful NCR 8270 minicomputer for the needs the West Slovakia Meat Industry, National Enterprise, in Bratislava, which will be located in Nitra and will be connected to a modular terminal system with NCR 3280 microcomputers in the facilities in Nitra, Levice, Nove Zamky and the general Directorate in Bratislava. From 1981, this computer system will be used to solve production ASR's designed for operational control of manufacture, livestock purchase, material and technical supplies, the control of technical preparation of manufacture and data bases on the levels of operation of farm and factory, and enterprise, with regard to the requirements for information for General Directorate.

In the milling and bakery industry, automated manufacture control in food industry enterprises based on the data bank principle should be solved and tested with the SM 4-20 minicomputer, beginning in 1982. Also, the connection of the minicomputer to a high-performance computer located in a VHJ should be solved.

In the sugar industry, we will be able to extend the application of control minicomputer systems employed in technological stations (nodal points), making use of the experience with the RPP 16 computer and SM 50/50 microcomputer in Juhocukor Dunajska Streda, National Enterprise, and other sugar factories in Sladkovicov, Rimavska Sobota and the Bakery in Sered.

Distilling and preserving industries will test the SMEP control micro-and minicomputer systems in:
--the manufacture of yeast;
--the air-conditioning of fermenting rooms by an electronic system for measuring nonelectric quantities;
--the automated control of experimental starch fermenters using a table calculator.

The tobacco industry will also continue employing minicomputers in production-economical activities and the application of minicomputers in the control of manufacturing processes is also being prepared.

SM 4-20 minicomputers will be used in the dairy industry to manage production-economical activities and ADT 4500's will be used to control dairy manufacturing processes.

Application of Small Electronic Computers in Project Institutes

According to the "Plan to Equip Project Facilities with Computer Technology", worked out by the Federal Ministry for Development of Technology and Investments in 1980, the Plan for the Agriculture and Food Industry (11 September 1980) calls for building a main computer center in the Land Economy Project Institute in Bratislava. At the end of the Seventh Five-Year Plan, this main computer center should be equipped with a Czechoslovak high-performance computer, permitting the application of the national model ASR designs in project activities to the conditions of the Land Economy Project Institute and Potravinoprojekt, or to other project solutions in this area.

Application of Small Electronic Computers in the Area of Central Control and the Scientific Research Basis

A high-performance EC 1055 computer with the possibility of connecting several SM 4-20 computers is planned for the central level of management and for scientific research basis of the agricultural sector for 1983. The connection was tested in terms of both operation and program in the first half of 1981. These minicomputers will serve as equipment for preparation and preprocessing of data for large computer systems and for processing independent small problems.

Since the application of mini- and microcomputer systems is very demanding, it is performed as an assignment of applied research as well as directly in enterprises. A uniform methodological basis for building ASR's is being elaborated in order to facilitate mastering of this process and a complex training program in mini- and microcomputer techniques is being prepared.

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REMOTE DATA PROCESSING WITH THE K 1600 MICROCOMPUTER

East Berlin RECHENTECHNIK-DATENVERARBEITUNG in German Vol 19, No 3, Mar 82 pp 8-11

[Article by Lothar Damme and Dr Klaus Hamann, VEB Robotron ZFT (Center for Research and Technology), Dresden: "Remote Data Processing With the K 1600." Translations of the articles by Gruenewald, cited in footnote 1, and by Rossberg, cited in footnote 2, are published in JPRS 79079, 28 Sep 81 No 716 of this series, pages 15-26 and 36-48, respectively]

[Text] The development of minicomputers on the basis of microprocessors and their high efficiency is also resulting in new possibilities for establishing remote data processing systems.

For the Robotron K 1600 microcomputer system (MCS) a remote data processing (RDP) design was developed which permits both the assembly of autonomous minicomputer RDP systems and their integration into the ESER [uniform electronic data processing system] RDP systems.

Connecting terminals of the "Decentralized Data Technology" product program of the Robotron Combine VEB to the K 1600 microcomputer system can be done via serial peripheral controls or via line control units (Robotron K 8523 multiplexor and Robotron K 8521 concentrator).

Remote coupling of the K 1600 MCS with an ESER EDP system is being realized.

In all the comprehensive applications being planned the MOOS 1600 operating system is used which is being expanded by program components in order to realize tasks typical of RDP.

List of Abbreviations:

AP	User Program (UP)
AIS	Serial peripheral control
CTC	Counter timer circuit
DFV	Remote data processing (RDP)
DMA	Direct memory access
FS-Netz	Teletype network
GDN	Direct current data transmission with low transmission level
KE	Coupling unit
KON	Concentrator (CON)
MK-Bus	Multicomputer coupling bus
MODEM	Modulator/demodulator
MPD4	Multiplexor for data transmission in the ESER RDP system
MRS K 1600	Microcomputer system Robotron K 1600
MUX	Multiplexor
SDA	Serial data adapter
SIO	Serial input/output
STE	Plug-in unit
SUL	Software

1. System Structure

1.1 Overview

The K 1600 microcomputer (Robotron K 1620/Robotron K 1630) provides the control core of the RDP system (Illustration 1). All equipment planned for the K 1600 MCS can be used as peripheral equipment. When connecting a few terminals (standard value n = 4) their linkage with the K 1600 can be accomplished via serial peripheral controls (AIS) K 8060. Four lines can be connected to an AIS. Since in the case of character interrupt-controlled data transmission between the K 1600 and the AIS the central unit is heavily loaded, it is necessary to use one or several multiplexors (MUX) when there is a large number of terminals and/or high rates of data transmission (maximum load for K 1600: 3-4 K bytes/sec ≙ 4 lines at 9,600 bauds in half-duplex and continuous operation).

In this way the central unit of the K 1600 is relieved of direct input/output and is available for processing tasks. Procedure control and operation of the interfaces is done in the multiplexor.

On-line coupling to the ESER EDP system (via MPD 4 [multiplexor for data transmission in the ESER EDP system] and the terminal control computers, respectively) is likewise realized by means of the multiplexor in the K 1600. Whether one of the 16 terminal connections of an MUX or one MUX with only one (fast) line is used for this coupling depends on the required speed of data transmission.

In place of a terminal a concentrator (CON) can also be connected in. Of the 16 terminals of the CON 1 is required for coupling to the MUX. The remaining 15 are available for connecting additional terminals.

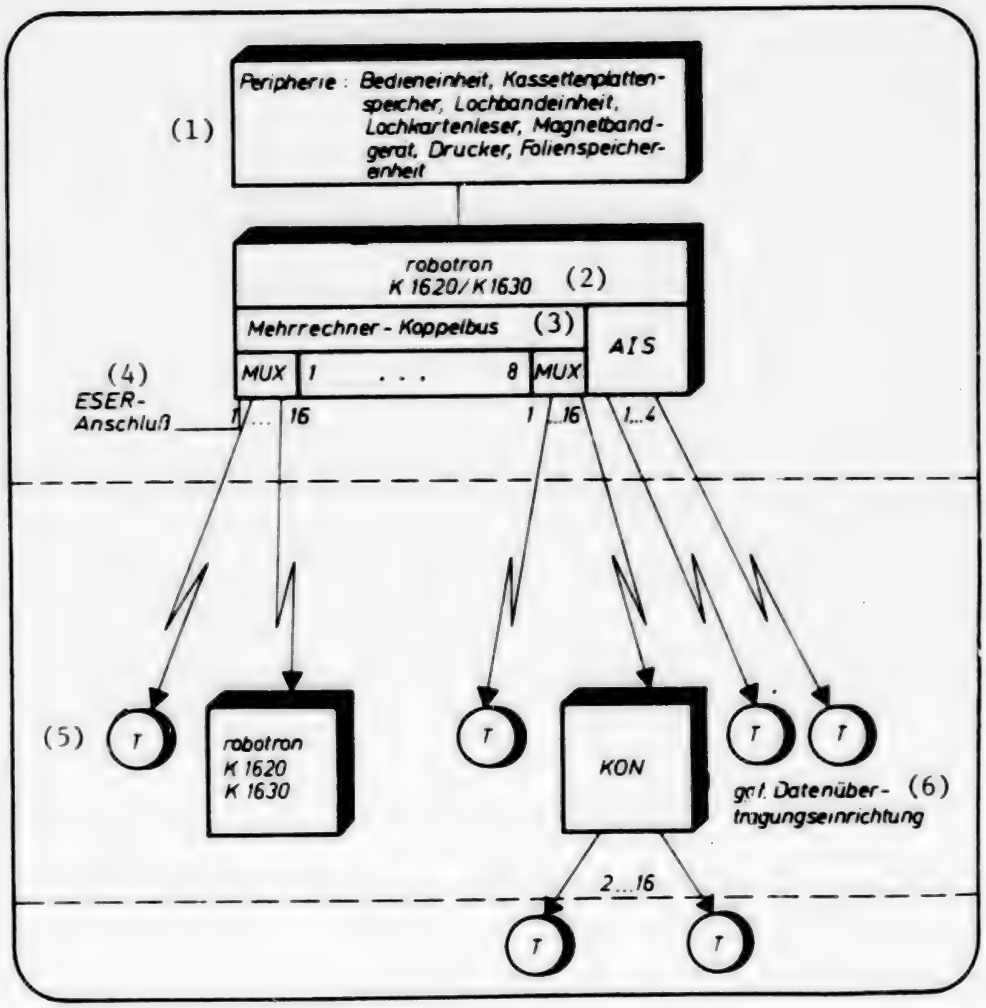

Peripherie : Bedieneinheit, Kassettenplattenspeicher, Lochbandeinheit, Lochkartenleser, Magnetbandgerat, Drucker, Folienspeichereinheit
(1)
robotron
K 1620/K 1630
(2)
Mehrrechner - Koppelbus
(3)
AIS
(4)
ESER-
Anschluß
MUX
1 . . . 8
MUX
1 ... 16
1 ...16
1...4
(5)
T
robotron
K 1620
K 1630
T
KON
T
T
ggf. Datenübertragungseinrichtung
(6)
2...16
T
T

Illustration 1. RDP with the Robotron K 1600 MCS

Key:

1. Peripheral equipment: operating unit, cassette disk storage, perforated tape unit, card reader, magnetic tape device, printer, film storage unit
2. Robotron K 1620/K 1630
3. Multicomputer coupling bus
4. ESER connection
5. Terminal
6. Data transmission device, as needed

Remote coupling of two K 1600 computers is also possible via multiplexors.

The terminals which are provided for connecting to the K 1600 are shown in Table 1. Connection with the K 1600 is done via point-to-point links or multipoint links, with or without data transmission devices, in half-duplex or duplex operation. Which of these kinds of linkage is used depends on the available lines and data transmission devices, on the coupling procedure and the terminals to be connected.

Table 1. Terminals of the RDP System on the Basis of Robotron K 1600

Designation	Control core	Operating system	Terminal image	Procedure
Office computer A 5110	K 2526	SIOS 1526 [*]	IFSS, V 24	AP 62/64, BSC, SDLC*
Office computer A 5120				
Office computer A 5130				
Display unit terminal K 8912	K 2521	Fixed program	IFSS, V 24	AP 62/64
Display unit terminal K 8914	K 2521	Fixed program	V 24	BSC
Universal display unit terminal K 8931	K 2526	SIOS 1526	V 24, IFSS	AP 62/64, BSC, SDLC*
Bank window terminal K 8924				
Printer terminal K 8951				
Seat reservation terminal K 8927				
Teletype T51/63			V 10	FS-Procedure

---

*Planned for

[*] Serial Input/Output System

1.2 Equipment Components

1.2.1 K 1600 Robotron Microcomputer System

Microcomputer with 16 bit processing range, storage capacity of 28 K words (K 1620) and 124 K words with storage switching equipment and arithmetic processor (K 1630), respectively.

Peripheral equipment: Robotron K 8911 operating unit, CM 5400 cassette disk storage, CM 5300 magnetic tape equipment, Robotron K 5261 cassette magnetic tape unit, Robotron K 6200 perforated tape unit, Robotron 1152 or Robotron 1157 series printer, VT 27065 parallel printer, EC 6112 card reader, diskette drive.

KE 16 coupling unit to couple to the MK bus [multicomputer coupling bus].

1.2.2 Robotron K 8523 Multiplexor Line Control Units and Robotron K 8521 Concentrator

The basic structure of the MUX and CON is shown in Illustration 2. The MUX is a fixed program control unit in the form of a slide-in chassis in the K 1600.

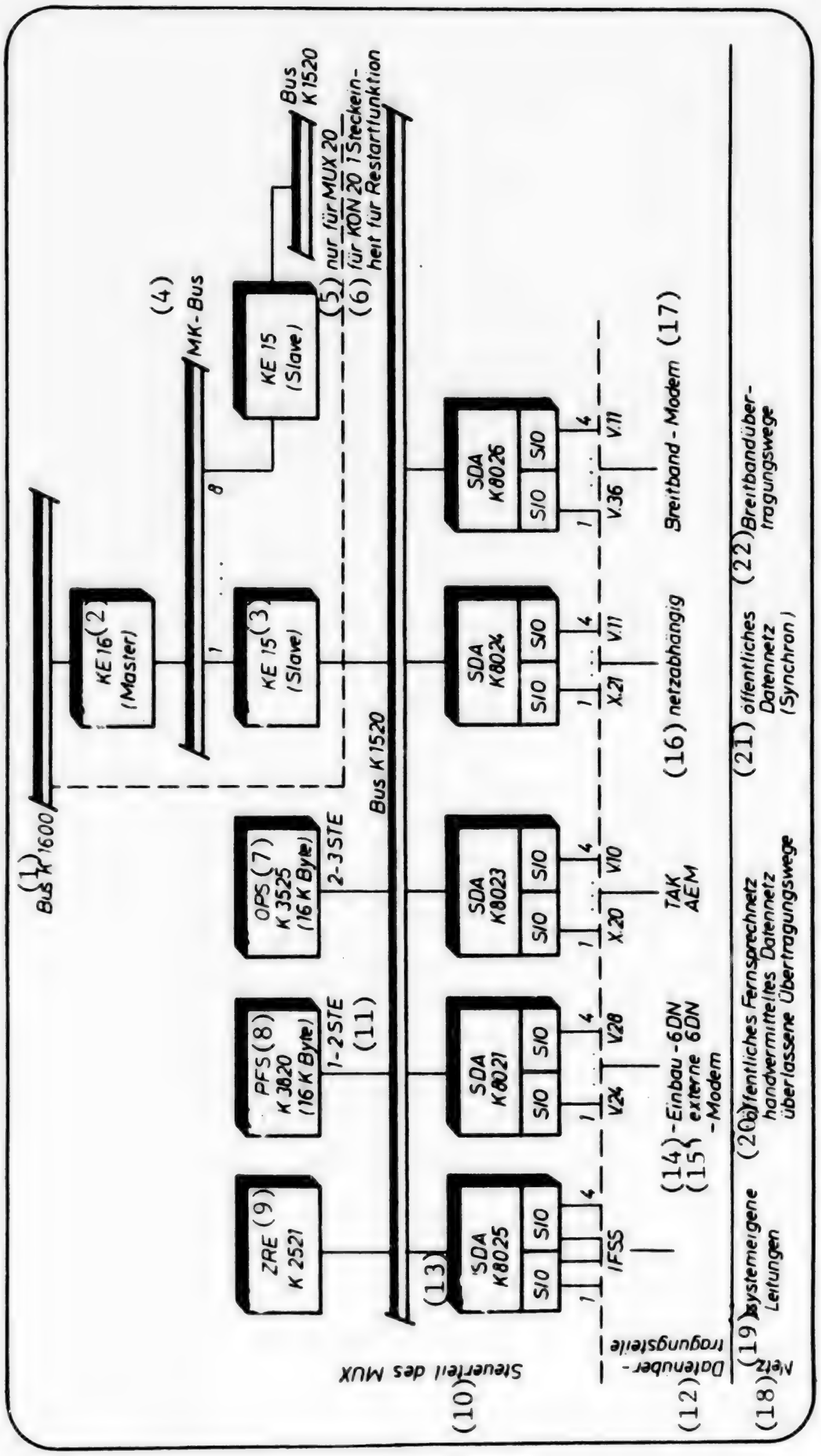


Illustration 2. Structure of the Line Control Units of Robotron K 8523/CON K 8521

[Key on following page]

Key:

1. Bus K 1600
2. Coupling unit 16 (master)
3. Coupling unit 15 (slave)
4. Multicomputer coupling bus
5. Only for MUX 20
6. For CON 20 1 plug-in unit for restart function
7. Operative storage (RAM) K 3525 (16 K bytes)
8. ROM K 3820 (16 K bytes)
9. Central computer unit
10. Control section of the MUX
11. 1-2 plug-in units
12. Data transmission sections
13. Serial data adapter
14. Installed 6 DN
15. External 6 DN
16. Network-dependent
17. Broadband-MODEM
18. Network
19. Lines in the system
20. Public telephone network; hand-switched data network; released transmission channels
21. Public data network (synchronous)
22. Broadband transmission channels

Equipping the MUX with programmable ROM and operative storage depends on the control program system generated. When used for only one data transmission procedure 16 K bytes PROM are adequate for the control program system.

The remaining address supply up to 64 K bytes is available for operative storage (RAM).

Connecting the maximum of 16 terminals is accomplished via (a maximum of 4) serial data adapters (Table 2). The serial data adapters (SDA) are supposed to adapt the K-1520 bus in parallel to the serial interfaces of the lines. The four channels of an SDA (reducible to two channels) have the same interface. Each SDA contains two SIO (serial input/output) circuits which in turn each have two I/O channels.

The SIO circuits, in addition to bit-serial reception and bit-serial transmission, take care of parity bit production and checking. Moreover, each SDA contains three counter timer circuits (CTC).

Every two lines of an SDA work at the same speed. By means of appropriate programming the SDA's can operate duplex or half-duplex, synchronously or asynchronously (exception: the IFSS interface only asynchronously). Coupling the MUX to the bus of the K 1600 is done via coupling units (2 plug-in units [STE] KE 15 in the MUX, 2 STE KE 16 in the K 1600 and multicomputer coupling bus [MK-bus]).

Table 2. Serial Data Adapter on the MUX/CON

Serial data adapter type	Interface	Maximum transmission speed (bits/sec)	Signal converter	Connection to public teletype network
K 8021	V 24/V 28	9,600	MODEM, GDN	Public telephone network, hand-switched data network, released transmission channels
K 8023	FS-X20/V 10	300	AEM/TAK	Teletype and data network, telex network, released teletype transmission channel
K 8024	X 21/V 11	48,000	Network-dependent	Teletype and date network
K 8025	IFSS	9,600	-	Line in the system
K 8026	V 36/V 11	72,000	Broadband MODEM	Broadband transmission channels

In line with the planned outfitting of the K 1600 with a maximum of eight MUX, eight KE 15 coupling units can be connected to the multicomputer coupling bus. Data transmission between MUX and K 1600 is accomplished in block manner in DMA [direct memory access] operation. The CON, in contrast to the MUX, is an independent device. Coupling unit and multicomputer coupling bus are unnecessary. The CON contains instead an STE for restart function. To operate the CON (system start, finishing test programs) one of the connected terminals is used.

1.2.3 Data Transmission Devices

Data transmission devices serve to adapt the interface to the conditions of the information channels and permit transmission of characters across great distances. In the RDP system described, MODEM's and GDN (direct current transmission with low level transmission) are used. Table 3 gives an overview of the data transmission devices planned for use.

1.2.4 Terminals

The terminals to be used in the RDP system on the basis of the K 1600 MCS are shown in Table 1.

2. K 1600 RDP Software

The RDP software for the K 1600 functions closely with the MOOS 1600 operating system. The MOOS 1600 makes possible efficient program finishing with the use of home peripheral equipment.

Table 3. Data Transmission Devices

Designation	Country of manufacture	Maximum transmission speed (bits/sec)	Inter-face	Transmission distance
MODEM AM 1200 (EC 8006)	Hungary	1,200	V 24	Arbitrary
MODEM TAM 601 (EC 8006)	Hungary	600/1,200	V 24	Arbitrary
GDN KATA 96 (EC 8028)	Hungary	9,600	V 24	Maximum 30 km
DNU 9600	GDR	9,600	V 24	Maximum 30 km
Broadband MODEM (planned for)	GDR	72,000	V 36	Arbitrary

At the levels of line control and information control the K 1600 RPD software supports the information exchange between user programs in the K 1600 and the remote components of the system according to Illustration 1.

The K 1600 computer does not handle the processing of tasks of line control, such as:

--time-division multiplex operation of lines;

--realizing guaranteed data transmission for various interfaces and transmission algorithms. These tasks are taken over by control programs in the MUX and CON line control units.

Organizing information traffic is done by the TCR 1600 information control program which operates with the MOOS operating system.

2.1 Control Program of the Line Control Units

The structure of the control program is characterized by two levels of priority, specifically:

--by the interrupt-controlled routines for character I/O via serial data adapters on the line side and block I/O via the multicomputer coupling bus;

--by program-controlled management routines for realizing the various transmission procedures, for analyzing control information, for starting and ending transmissions.

The RAM storage unit of the MUX is subdivided into:

--information fields for information waiting lines and line and coupling unit control blocks with constant data on the line characteristics and the actual processing level;

--dynamically managed buffer areas.

In these buffers the data and control characters, which are collected in interrupt operation in a time-division multiplex manner via the lines and evaluated in a way appropriate to the procedure, are joined together into complete information, or the complete information transmitted from the K 1600 to these buffers is outputted to the lines in divided traffic.

Filling the information fields according to the configuration of the RDP system, setting the initial values and activating the start of the control program are accomplished via the MK-bus through the K 1600 central computer.

The structure and operation of the control program of the CON are analogous to those of the MUX. The routines for block I/O via the MK-bus do not apply. The control program additionally contains an operating module. This supports communication between CON and a selected terminal. In particular, this affects the input of information to the terminals connected to the CON and the realization of start and test functions.

2.2 TCR 1600 Information Control Program

The TCR 1600 is a modularly structured program system which operates with high priority under the control of the MOEX 1600 executive system.

The basic function of the TCR 1600 consists in organizing information traffic between:

--user program (UP) of the K 1600 and the terminals;

--UP of the K 1600 and UP in an ESER EDP system or in another K 1600;

--terminals on the K 1600 and UP in an ESER EDP system.

When the system starts, the information for the RDP configuration which is to be supported must be communicated by the K 1600 operator to the TCR 1600. Then the traffic between the UP in the K 1600 and the TCR 1600 takes place by means of descriptive and executive macrostatements. These permit the programmer a similar kind of operation as in the case of interaction with home peripheral equipment.

The essential functions of the components shown in Illustration 3 indicate the performance of the TCR 1600:

Central modules

--interaction between time-sharers;

--organization of waiting lines and buffers.

Network management module

--structure and management of the actual configuration table (information on procedures, line conditions, among other things).

Start module

--setting a definite start condition;

--filling information fields in the MUX.

Operating module

--commands for starting and for test work;

--input of changes in configuration;

--output of allocation lists, error statistics.

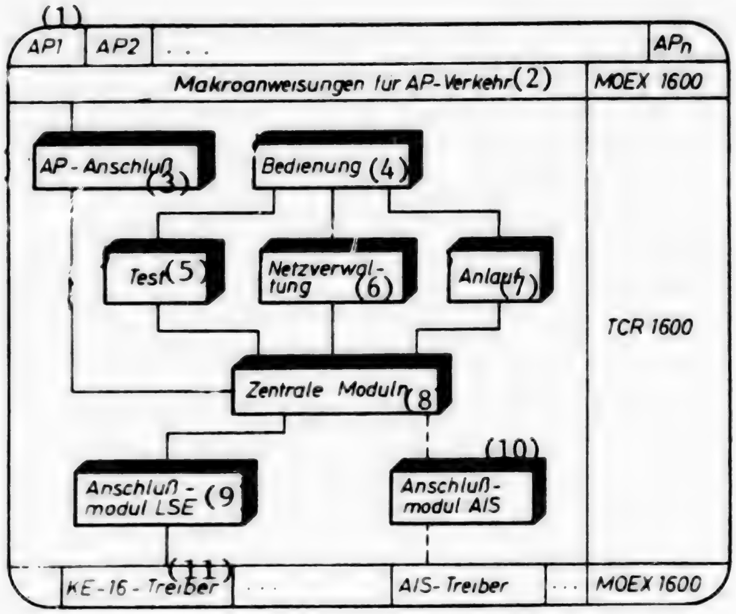
Connecting modules for application programs in the K 1600, for MUX and AIS

--realizing the connection conditions for the respective drive.

Test module

--off-line and on-line test of the equipment chain.

The KE 16 drive accomplishes the physical exchange of blocks of fixed length in the DMA sector with the MUX. When connecting terminals via AIS the tasks of line control are taken over by their drives. Interaction between AIS drive and TCR 1600 is guaranteed.



Key:

1. User program 1
2. Macrostatements for user program traffic
3. User program connection
4. Operation
5. Test
6. Network management
7. Start
8. Central modules
9. Line control unit connection module
10. AIS connection module
11. Coupling unit 16 drive

Illustration 3. Structure of the TCR 1600 Information Control Program

3. Use

It was shown that unhampered configurability and modularly structured software characterize the RDP design for the K 1600 MCS. On this basis it is possible to solve a quite varied array of use tasks which make optimal use of the efficiency of the individual components of the RDP system. Variants for the use of the K 1600 RDP software are:

Terminal-Oriented Robotron A 6421 and Robotron A 6422 Base Computer Systems

A broad assortment of terminals on the K 1600 as the central computer is used for data gathering and output primarily in the conversational mode. In the central computer a data processing program packet, which is tailor-made for the application, operates under the MOOS 1600 operating system. Typical systems are the DSS-30 data gathering system, the KSS cash collection system and the PDLS production data collecting and guidance system for discontinuous processes.

Robotron A 6401 and Robotron A 6402 Commercial Base Computer Systems, Robotron A 6491 and Robotron A 6492 Process Computer Systems

The home resources of the K 1600 MCS are used primarily to solve a technical application problem. Beyond that, there is information exchange with remotely coupled components of the overall system.

Remote terminals, for example, serve to output information about the level of processing in the central computer, about certain conditions in the process to be controlled and about interruption of the processing operation by the operating personnel. Compressed data are transmitted in a time-cyclic or event-controlled manner to a superordinated computer, another K 1600 or an ESER EDP system; after they have been evaluated, predetermined values, which control the further course in the use-application system, are retransmitted.

Remote Coupling With an ESER EDP System

By remote coupling of the K 1600 with an ESER EDP system the collection, checking and preliminary processing of data at the place of origin and the output of results of centralized ESER projects at the destination become possible. Information exchange is largely done in the form of big data batches between the respective external storage media.

Remote Coupling of Two K 1600 Microcomputers

Two K 1600 computer systems process a comprehensive set of tasks at the same time at different locations. The principles of the interaction between the computer systems as a function of the sphere of application can be quite diverse.

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MEDICAL ACADEMY HEAD DISCUSSES DOCTORS' TRAINING, RESEARCH

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["The Scientist and His Humanistic Responsibilities," interview with Prof Dr Constantin Arseni, by Magdalena M. Popa]

[Excerpts] Question: We know that you, Prof Dr Constantin Arseni, are the head of the neurosurgery clinic at "Gheorghe Marinescu" Hospital, the chairman of the Academy of Medical Sciences, and the chairman of the bureau of the Central Committee of the Organizations of Socialist Democracy and Unity. How do you combine these many activities, of profound responsibility?

Answer: I have always been a precise, punctual and, especially, organized person. According to a mathematical precision, I set my schedule each day. I always keep promptness in mind. No matter what the problem is, I must solve it immediately.

Question: Recently, your hospital has been supplied with ultramodern equipment and advanced therapeutical methods and new surgical techniques have been assimilated. What new results have been achieved?

Answer: At the present time we have the largest neurosurgery clinic in the world in regard to the number of beds--650. The largest clinics abroad have only 120 beds. Our equipment is very expensive, for example, the tomograph computer which photographs the brain in sections, and other equipment which determines the speed at which the blood is circulating in the brain. We take care of all branches of neurosurgery--brain tumors, cranial trauma, and, more recently, vascular surgery on the brain (we now have a special pavilion for this), with very good results.

We have constantly adopted new surgical techniques which are being used abroad. We are known as the school of neurosurgery with the richest activity in the world. We have had the intuition to devise new treatments and this makes everyone have great confidence in us. But the results we have obtained here in our country do not keep us from being informed about the results obtained abroad and about the specialization of our doctors in other medical sciences centers in the world. On the contrary, they require that we keep informed.

Question: There has been much talk about the existence of a gap between the top medical doctors who are near retirement age and the younger generation. What should be done to get rid of this gap?

Answer: Much is being said about this gap, not only in our country but also in the entire world. This is a result, perhaps, of the fact that we have not been sufficiently concerned about medical education. Much is being said about the lack of specialists, since the period of specialized training is longer. A surgeon is not made in 4 or 5 years. In my opinion, a good surgeon is trained in 10-15 years, depending on his specialty. I believe that the experience of the giants of medicine should be communicated, in an organized form, to the new generations.

Persons who want to become general practitioners should have an on-the-job training period of two years. The future doctors who do well and want to specialize should be given an examination for specialization, immediately after they finish the faculty, wihout any other training period. I propose more extensive preparation than is currently the case, followed by a difficult examination.

Question: What do you think about the intern-extern system which is no longer in effect?

Answer: I think that the intern-extern system is necessary but there are some who do not agree with me. The great doctors in Romania and in the entire world have been intern-externs.

Question: You are chairman of the Academy of Sciences which has especially important tasks in promoting new elements in scientific research. Please tell us how this academy carries out its activity to ensure that the new is promoted and no valuable idea is lost.

Answer: The purpose and role of the Academy of Medical Sciences is a single one: science. Recently, I spoke with minister [of health], Eugen Proca who told me that it takes 10 years for a drug to appear on the market and millions of hard currency lei are spent before the drug is approved. It has to be tested in 2 or 3 institutes; then it has to be submitted to the Institute for Medicines for tests in regard to the content and dosage; then experiments are conducted on animals and, later, in hospitals or clinics. Finally, the drug is put on the market. We have made some mistakes in this area but, fortunately, without repercussions. However, if anyone were to discover a cure for cancer it is certain that such a spectacular result would be promoted immediately by our scientific forum. I am convinced that, in the future, cancer will be cured by medical treatment and not by surgical treatment. This is why the Academy of Medical Sciences promotes new inventions. But something new should be viewed neither with too much enthusiasm nor with negativism. It should be studied seriously and should be documented; even some unsuccessful results can be repeated. You should not say yes or no but only observe closely and look again.

Question: Please discuss the current situation of Romanian medical science.

Answer: I will limit myself to the field with which I am concerned. We have done everything to ensure that Romanian neurosurgery occupies a place of prime importance on the international level. We publish in all the reviews in the world. In regard to experience, we have accumulated a spectacular record: more than 40,500 cranial traumas. Unfortunately, however, the theoretical progress is not always in accordance with the statistical results. Although we have interesting scientific research being conducted in the Institute of Neurology and Neurosurgery by Prof Vlad Voiculescu, a distinguished neurologist, in general, there is a gap between research and practice, a gap which must be reduced or eliminated. I believe that in the future we will have very fine results, with the assistance of the National Council for Science and Technology.

We are always publishing new works on the international level. We were the first ones in the world to compile a work of mathematical statistics in neurosurgery. However, I must stress the fact that if you want to be in science you have to publish in foreign languages, so that you will become known in the entire world or so that you will receive international approval. In this sense, I am stressing the issue of medical priorities. I had one book "Parazitii din creier" [Parasites in the Brain]. It had world-wide priority. But I wrote another one--"Endocrinoneurochirugia" [Endocrinological Neurosurgery]--which remained at the publishing house three years before it was printed; in the meantime, the Americans published something similar, three years before I did and they have priority. But I have one consolation--they publisehd fragments from articles, not a book. It would be a good idea if the Academy of Medical Sciences and the National Council of Science and Technology would determine what books constitute priorities so that they can be launched in the international sphere on time.

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